ACS 2026 Surgeons and Engineers: A Dialogue on Surgical Simulation

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Promoting Technology and Collaboration

3D Printing High-Resolution Models in Silicone Rubber

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Background: Anatomical training models are frequently made using DIY techniques to balance realism with repeatability and affordability. Casting silicone rubber is one technique that can create realistic-feeling soft tissue, and silicone rubbers are available with a range of physical properties to mimic different tissues. However, designing and creating molds for silicone rubber models can take as much time as designing the model itself.

Technology Overview: We are developing 3D printable silicone rubber inks that can be used in off-the-shelf 3D printers to create high-resolution models without requiring any mold design or creation. Our materials can be tuned to a range of physical properties. We have demonstrated features as small as 0.3mm tunnels for simulating blood vessels, and our 3D printer can print parts as large as 160 x 160 x 70 mm.

Potential Application in Surgical Simulation and Education: We believe that 3D printing with our materials could enable the rapid creation of complex anatomical models with new geometries that are not easily moldable. Lumens such as organs or blood vessels are potential candidates. The transparency of our materials would also be suitable for visually observing changes to the insides of the models.

Potential Opportunities to Collaborate: Our background is in materials and mechanical engineering with limited exposure to anatomy, so we are still trying to identify what types of models would benefit from our technology. Collaborative opportunities to develop, create, and test anatomical models using our 3D printing materials would be a great next step.